

SURVEY OF THE SOUTH CAROLINA SHRIMP BAITING FISHERY

1992

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ABSTRACT

Information on the 1992 shrimp baiting fishery was obtained from a postseason mailout survey sent to 26.6% of the 11,571 permit holders. The return rate at the end of the designated three-week response period was 42.3%. An estimated 10,105 permit holders and 21,707 assistants participated in the fishery, making 62,459 trips to catch 2.35 million pounds of whole shrimp. Permit holders made an average of 6.12 trips per individual. Residents of coastal counties (including Berkeley, Dorchester, and Hampton) represented 73% of the permit holders, expended 81% of the effort, and caught 78% of the shrimp. The metropolitan Charleston area received relatively less effort and contributed a smaller portion of the total catch than in previous years. The statewide catch rate (25.4 quarts/trip) was a little above average for the last six years. About 94% of the respondents indicated that they would purchase a permit in 1993.

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INTRODUCTION

Theiling (1988) described the history of shrimp baiting in South Carolina and the first survey (1987) of this fishery. Since then, surveys have been conducted for each season using various combinations of on-site intercept and postseason mailout methods (Waltz and Hens 1989, Low, 1990, Low 1991, Low 1992). These studies have addressed diverse aspects such as demographics of participants, constituency opinions of management options, user group conflicts, and economic parameters in addition to monitoring fishery characteristics such as catch and effort.

The 1992 season began at noon on 11 September and ended at noon on 10 November. Information on the fishery was obtained from a postseason mailout survey. Objectives were to 1) estimate total participation (i.e., the number of active permit holders and their assistants), 2) estimate total effort (i.e., the number of trips), 3) estimate total catch, and 4) estimate effort and catch by major fishing areas.

METHODS

A self-addressed, postage-paid card questionnaire (Appendix 1) and introductory letter were mailed to 3,078 (26.6%) of the 11,571 permit holders. The mailout was stratified according to area of residence in direct proportion to the distribution of permit holders (Table 1). Within each geographic category, recipients were selected at random in rough proportion to their representation by zip code. After adjustment for non-deliverables, the effective mailouts were as follows: 1) Northern Coastal Group, N = 186; 2) Central Coastal Group, N = 1,306; 3) Southern Coastal Group, N = 743; 4) Central Inland Group, N = 556; and 5) other areas, N = 259 (total sample = 3,050).

A three-week interval was allowed for response; a longer period would have extended the time frame of effective recall beyond 60 days from the end of the season. By the end of the response period, the target sample size (based on variances observed during previous surveys) had been obtained and the stratification of respondents was comparable to that of the overall permit holder population (Table 2). Questionnaires received after this time frame were not included in the survey results.

RESULTS

The overall response rate during the designated three-week interval was 42.3% after adjustment for nondeliverables with 1,291 usable returned questionnaires. Response rates were lowest (37.9%) from residents of Charleston County and highest (49.4%) from residents of counties contributing less than 1% of the participants.

Participation

Statewide, nearly 13% of the permit holders did not make at least one trip using their tags and poles. Some presumably participated as assistants to other permit holders; however, the

Table 1. Distribution of permit holders in 1992 compared to that in 1991.

Residence category	1992		1991	
	N	% of total	N	% of total
<u>Northern Coastal</u>				
Georgetown County	555	4.8	539	4.5
Horry County	154	1.3	142	1.2
Total	709	6.1	681	5.7
<u>Central Coastal</u>				
Berkeley County	1,211	10.5	1,392	11.6
Charleston County	3,094	26.7	3,562	29.7
Dorchester County	667	5.8	747	6.2
Total	4,972	43.0	5,701	47.5
<u>Southern Coastal</u>				
Beaufort County	1,436	12.4	1,413	11.8
Colleton County	586	5.1	587	4.9
Hampton County	431	3.7	443	3.7
Jasper County	360	3.1	351	2.9
Total	2,813	24.3	2,794	23.3
<u>Central Inland</u>				
Aiken County	379	3.3	344	2.9
Allendale County	124	1.1	126	1.0
Bamberg County	177	1.5	177	1.5
Barnwell County	193	1.7	202	1.7
Lexington County	481	4.2	383	3.2
Orangeburg County	444	3.8	440	3.7
Richland County	291	2.5	263	2.2
Total	2,089	18.1	1,935	16.1

Other

Abbeville County	49	-1.0	58	-1.0
Anderson County	45	-1.0	40	-1.0
Calhoun County	77	-1.0	82	-1.0
Cherokee County	4	-1.0	3	-1.0
Chester County	15	-1.0	11	-1.0
Chesterfield County	8	-1.0	5	-1.0
Clarendon County	51	-1.0	43	-1.0
Darlington County	41	-1.0	32	-1.0
Dillon County	13	-1.0	15	-1.0
Edgefield County	36	-1.0	28	-1.0
Fairfield County	27	-1.0	23	-1.0
Florence County	76	-1.0	69	-1.0
Greenville County	66	-1.0	66	-1.0
Greenwood County	30	-1.0	29	-1.0
Kershaw County	33	-1.0	27	-1.0
Lancaster County	11	-1.0	7	-1.0
Laurens County	23	-1.0	21	-1.0
Lee County	7	-1.0	3	-1.0
McCormick County	1	-1.0	2	-1.0
Marion County	13	-1.0	8	-1.0
Marlboro County	4	-1.0	3	-1.0
Newberry County	43	-1.0	34	-1.0
Oconee County	21	-1.0	16	-1.0
Pickens County	17	-1.0	9	-1.0
Saluda County	20	-1.0	14	-1.0
Spartanburg County	40	-1.0	32	-1.0
Sumter County	73	-1.0	67	-1.0
Union County	14	-1.0	12	-1.0
Williamsburg County	89	-1.0	94	-1.0
York County	30	-1.0	31	-1.0
Nonresident	11	-1.0	10	-1.0
Georgia	10			
North Carolina	1			
Total	988	8.6	894	7.4
GRAND TOTAL	11,571		12,005	

Table 2. Distribution of permit holders and respondents by residence category.

Residence category	% of permit holders	% of respondents
Northern Coastal	6.1	6.2
Central Coastal		
Charleston County	26.7	23.8
Berkeley/Dorchester Counties	16.3	17.0
Southern Coastal	24.3	23.9
Central Inland	18.1	19.1
Other	8.6	9.9

Table 3. Estimated participation by residential category.

	Northern Coastal	Central Coastal Chas.	Berk./Dorch.	Southern Coastal	Central Inland	Other	Total
Permits issued	709	3,094	1,878	2,813	2,089	988	11,571
Percent active	86.2	84.4	88.2	88.7	89.0	88.4	87.3
Number active	611	2,611	1,656	2,495	1,859	873	10,105
Avg. no. of assistants	1.91	2.23	2.08	2.18	2.18	2.04	2.15
No. of assistants	1,167	5,823	3,444	5,439	4,053	1,781	21,707
Total participants	1,778	8,434	5,100	7,934	5,912	2,654	31,812
Percent active in designated month							
September	65	66	67	71	73	58	68
October	84	88	87	84	86	79	85
November	60	62	64	57	52	41	57

extent of such activity cannot be determined using the present survey format. Participation rates (Table 3) were rather consistent between residential categories. The estimated number of active permit holders was obtained by multiplying the number of permits issued in each residential category by the percentage of active respondents. Assistants were the numbers of different individuals who joined the permit holders on their trips. Undoubtedly, some individuals were counted by more than one permit holder respondent, but there was no way to determine this. The average number of assistants per permit holder reported for each residential category was multiplied by the estimated number of active permit holders to obtain the estimated number of assistants. The total numbers of participants in each residential category equalled the sum of the active permit holders and assistants.

Respondents were asked to estimate the number of trips they made in each month and most did so. About two-thirds of the shrimpers made at least one trip in September and a little over half went during November. Participation was greatest during October. Inland residents were somewhat less likely to shrimp during the last few weeks of the season than were coastal residents.

Effort

The average number of season trips per active permit holder was obtained by summing the number of trips in each residential category and dividing this figure by the number of active permit holders. These means were then multiplied by the numbers of estimated active holders in the overall populations to obtain estimates of seasonal effort by residential category (Table 4). The estimated numbers of trips per month were calculated by multiplying these season totals by the appropriate percentages of trips in each month, as determined from the data provided by respondents who broke their seasonal effort down into complete monthly components. The estimated effort figures shown in the "total" category are those generated by summing the categorical figures.

An alternative procedure is to multiply the number of permits sold (11,571) by the active percentage (87.3%) from Table 3 to generate the estimated number of total active permit holders (i.e., $N = 10,105$). This value multiplies by the pooled average trips/permit holder (6.12) from Table 4 gives a total effort estimate (61,843 trips) which can then be multiplied by the pooled monthly percentages (from the "total" column in Table 4) to obtain another set of monthly effort estimates. This method provides estimates of 18,553 trips in September, 29,066 in October, and 14,224 in November.

The coastal area was divided into six geographical components (Fig. 1). The relative distribution of effort by fishing area is indicated in Table 5. These figures were obtained by multiplying the total number of trips in each residential category by the percentages of effort reported for each area. These values were derived by compiling for each residential category the number of trips reported in each fishing area, summing these figures, then determining their percentages of the total.

The Beaufort area received the greatest amount of shrimping effort in 1992, followed by the Charleston metro area. Of the less

Table 4. Estimated effort (number of trips) by residential category.

	Central Coastal						
	Northern Coastal	Chas.	Berk./ Dorch.	Southern Coastal	Central Inland	Other	Total
Avg. trips/active permit holder	5.91	6.54	7.22	7.16	4.80	3.47	6.12
Percent of total trips by month							
September	34	29	27	32	33	30	30
October	46	47	47	44	49	50	47
November	20	24	26	24	18	20	23
Estimated trips/month							
September	1,228	4,952	3,228	5,716	2,945	909	18,978
October	1,661	8,026	5,619	7,860	4,372	1,515	29,053
November	722	4,098	3,109	4,288	1,606	605	14,428
Estimated season trips	3,611	17,076	11,956	17,864	8,923	3,029	62,459
Percent of total effort							
1992	6	27	19	29	14	5	
1991	5	32	19	27	12	6	
1990	4	38	18	26	-	-	



- BF - BEAUFORT (including Calibogue and Port Royal Sounds, Broad River)
- SH - ST. HELENA SOUND (including Coosaw, Combahee, and Ashepoo Rivers)
- WE - WADMALAW/EDISTO ISLAND (including N. and S. Edisto Rivers)
- CH - CHARLESTON HARBOR (including Kiawah, Stono, Folly, Ashley, Cooper and Wando Rivers)
- BB - BULLS BAY (including McClellanville area)
- GH - GEORGETOWN (including Santee and Winyah Bays and Horry County intracoastal waterway)

Fig. 1. Shrimp baiting areas.

Table 5. Estimated effort (number of trips) by fishing area.

Residential category	Beaufort	St. Helena	Fishing area Wadmalaw/Edisto	Charleston	Bulls Bay	Georgetown
Northern Coastal	18	0	0	134	2,576	883
Central Coastal						
Chas.	73	104	2,935	11,457	2,507	0
Berk./Dor	697	103	1,411	7,181	2,555	9
Southern Coastal	14,876	2,386	410	55	137	0
Central Inland	6,558	766	936	306	289	68
Other	1,231	489	260	150	812	87
Total	23,453	3,848	5,952	19,283	8,876	1,047
Percent of total,						
1992	38	6	9	31	14	2
1991	35	5	8	34	15	3
1990	31	6	7	49	3	4

accessible areas, Bulls Bay was the most popular. There was very little shrimping activity north of Bulls Bay.

The distribution of statewide seasonal effort is shown in Table 6. Nearly half of the respondents made fewer than five trips in 1992 while the percentages in the higher effort categories (>10 trips) were nearly identical to those in 1991. In contrast, 21% of the respondents in 1990 made more than ten trips.

Catch Rates

Table 7 lists the average seasonal catch rates for each residential category. These were obtained by adding up the reported CPUE values in each category and dividing by the number of respondents. The CPUE values in Table 8 were obtained by adding all of the season catch estimates reported for a given area and dividing this figure by the sum of reported effort. Only the data from respondents who limited their activity to one area were included, since there was no way to separate catch and effort by area for respondents who shrimped in more than one location. Shrimping was considerably better in the southern part of the state and particularly poor in the Winyah/Santee Bays area.

Because the residential stratification of the respondent population was comparable to that of the total active permit holder population, an unbiased estimate of the average statewide seasonal catch rate can be obtained by dividing the sum of reported seasonal catches by the total reported number of trips (ratio of averages value). This provides a seasonal CPUE estimator of 25.66 quarts of whole shrimp per trip. Another approach is to calculate the average of ratios statistic by adding up the CPUE figures reported by respondents and dividing this sum by the number of observations: this value is 25.35 quarts per trip. The latter statistic is usually preferred because it is unweighted by the distribution of effort and normality assumptions are better met (Rothschild and Yong 1970). In this application, there is little practical difference in which figure is used because of their similarity.

The distribution of average seasonal CPUE is indicated in Table 9. Shrimpers from the Central Inland counties had larger average catches while residents of Georgetown and Horry Counties did not fare nearly as well as shrimpers from the rest of the state.

Catch

There are numerous ways to estimate the total catch and the following examples are used primarily to illustrate the range of values that can be derived.

Because of the similar residential composition of the total permit holder population and the respondent group, an unbiased catch estimate can be obtained by multiplying the estimated total number of trips by the average of ratios CPUE estimator. Using the higher of the two effort estimates (62,459 trips), this produces a value of 1,583,336 quarts of whole shrimp. With the lower effort estimate the corresponding figure is 1,567,720 quarts. The figures obtained by using the ratio of averages statistic are slightly higher.

Another approach is to multiply the estimated number of trips in each fishing area by the average catch rate for that area, as summarized below using data from Tables 5 and 8:

Table 6. Distribution of statewide seasonal effort.

Residential category	Trips/individual/season				
	<5	5-10	11-15	16-20	>20
Northern Coastal	54%	33%	6%	3%	4%
Central Coastal					
Charleston	43%	39%	14%	3%	1%
Berkeley/Dorch.	40%	43%	11%	3%	3%
Southern Coastal	41%	40%	11%	4%	4%
Central Inland	57%	38%	4%	0%	1%
Other	73%	24%	3%	0%	0%
Total, 1992	48%	38%	9%	2%	3%
1991	58%	30%	8%	2%	3%

Table 7. Catch rates (quarts of whole shrimp/trip) by residential category.

Residential category	CPUE
Northern Coastal	15.0
Central Coastal	
Charleston	23.4
Berkeley/Dorchester	25.5
Southern Coastal	26.3
Central Inland	30.3
Other	25.1

Table 8. Catch rates (quarts of whole shrimp/trip) by fishing area.

Fishing area	CPUE	No. of observations
Beaufort and vicinity	28.7	388
St. Helena Sound area	29.7	44
Wadmalaw/Edisto Islands	30.0	77
Charleston metro area	23.4	225
Bulls Bay	20.3	97
Georgetown area	14.4	17

Table 9. Distribution of average seasonal CPUE (quarts/trip), in percentages of respondents.

Residential category	CPUE				
	<10	10-20	21-30	31-40	41-48
Northern Coastal	35	42	14	6	3
Central Coastal					
Charleston	15	35	26	14	10
Berk/Dorch.	12	24	31	19	14
Southern Coastal	15	24	23	20	18
Central Inland	6	24	24	23	24
Other	20	27	20	14	19
Total, 1992	15	28	24	17	16
1991	22	33	25	10	9

<u>Fishing area</u>	<u>Trips</u>	<u>CPUE</u>	<u>Catch (whole quarts)</u>
Beaufort & vicinity	23,453	28.7	673,101
St. Helena Sd. area	3,848	29.7	114,286
Wadmalaw/Edisto Is.	5,952	30.0	178,560
Charleston metro	19,283	23.4	451,222
Bulls Bay	8,876	20.3	180,183
Georgetown/Horry	1,047	14.4	15,077

The sum from this approach is 1,612,429 quarts.

Another method is to multiply the number of active permit holders in each residential category by the average number of trips per permit holder to obtain the effort estimates, then multiply these by the mean CPUE for each category. Using data from Tables 4 and 7, these results are as follows:

<u>Residential category</u>	<u>Trips</u>	<u>CPUE</u>	<u>Catch (whole quarts)</u>
Northern Coastal	3,611	15.0	54,165
Central Coastal			
Charleston	17,076	23.4	399,578
Berkeley/Dorchester	11,956	25.5	304,878
Southern Coastal	17,864	26.3	469,823
Central Inland	8,923	30.3	270,367
Other	3,029	25.1	76,028

The sum of the catches by residential category is 1,574,839 quarts.

Within each residential category, the catch rate reported by each respondent can be multiplied by the number of trips reported to obtain that individual's season catch or the estimate provided by the respondent can be used. The average season catch can then be calculated and multiplied by the number of active permit holders in that residential category. This procedure, using the season catch estimates provided by the respondents, produces the following results:

<u>Residential category</u>	<u>Average catch</u>	<u>Active permits</u>	<u>Catch</u>
Northern Coastal	86.5	611	52,852
Central Coastal			
Charleston	151.0	2,611	394,261
Berkeley/Dorchester	183.1	1,656	303,214
Southern Coastal	197.3	2,495	492,264
Central Inland	148.2	1,859	275,504
Other	93.4	873	81,538

The total estimate from this procedure is 1,599,633 quarts.

The following summarizes the range of estimates for the various residential categories and fishing areas:

<u>Residential category</u>	
Northern Coastal:	52,852 - 54,165 quarts
Central Coastal - Charleston:	394,261 - 399,578 quarts
Berkeley/Dorchester:	303,214 - 304,878 quarts
Southern Coastal:	469,823 - 492,264 quarts

Central Inland: 270,367 - 275,504 quarts
 Other: 76,028 - 81,538 quarts

Fishing area

Beaufort and vicinity: 673,101 quarts (42%)
 St. Helena Sd. and vicinity: 114,286 quarts (7%)
 Wadmalaw and Edisto Islands: 178,560 quarts (11%)
 Charleston metropolitan area: 451,222 quarts (28%)
 Bulls Bay: 180,183 quarts (11%)
 Georgetown/Horry area: 15,077 quarts (1%)

The estimated total catch ranged from 1,567,720 to 1,612,429 quarts of whole shrimp (equivalent to 2.329 - 2,386 M pounds). The average of the various estimates was 1,587,591 quarts, equivalent to 2.350 M pounds of whole shrimp and 1.53 M pounds of headed product.

The distribution of catches per permit holder is shown in Table 10. Based on the above estimate of total catch and the estimated numbers of active permit holders and their assistants, the average permit holder caught about 157 quarts (233 pounds of whole shrimp). Assuming that this was evenly shared among the permit holders and their assistants, the typical participant in the 1992 fishery obtained about 50 quarts (74 pounds) of whole shrimp.

DISCUSSION

Survey Reliability

Since the residential composition of the respondent population was comparable to that of the total permit holder population, the CPUE estimator obtained by averaging the figures provided by the sample group should be an unbiased index. The sample size ($N = 1,122$) used to estimate overall mean CPUE provided a value within $\pm 3.5\%$ of the true mean (95% confidence level) for the variance observed. This index multiplied by the estimated total number of trips should therefore generate a reasonably reliable estimate of the total statewide catch. The upper and lower limits of the range of estimates were within 1.5% of this value.

The survey approach assumes that the CPUE estimates provided by the respondents accurately represented actual catch rates. Results from the 1989 survey, which included a creel census, showed no significant difference between the shrimpers' estimates of what they had caught and the actual catches. In the 1992 survey, an attempt was made to monitor catch rates in-season by distributing catch reporting cards to shrimpers when they purchased their permits. These postage-paid, self-addressed cards requested shrimpers to record the date, fishing area, and amount caught for their trips as they made them, thus minimizing recall problems. Only two dozen cards were received and the resultant sample sizes were therefore very small, as indicated below. Nevertheless, with the exception

Table 10. Distribution of season catches (quarts of whole shrimp), in percentages of respondents by residential category.

Residential category	Catch					
	≤99	100-199	200-299	300-399	400-499	≥500
Northern Coastal	74	13	7	3	1	1
Central Coastal						
Charleston	50	22	14	6	3	5
Berk./Dorch.	38	28	15	11	4	4
Southern Coastal	41	24	17	6	6	6
Central Inland	44	33	11	4	5	3
Other	63	25	8	1	2	1
Total, 1992	47	25	13	6	4	5
1991	54	24	14	4	2	2

Table 11. Season comparisons of participation, effort, and catch parameters.

	1987	1988	1989	1990	1991	1992
Permits issued	NA	5,509	6,644	9,703	12,005	11,571
Percent active permits	NA	92	82	94	89	87
Assistants/permit holder	NA	2.50	2.14	2.79	2.24	2.15
Participants	21,735	17,749	17,171	34,662	34,821	31,812
Trips/permit holder	NA	6.99	5.73	7.78	6.56	6.12
Total effort (trips)	40,101	35,609	31,624	71,153	71,034	62,459
Quarts/trip (whole shrimp)	28.5	22.1	26.5	25.6	21.3	25.4
Total catch (M pounds whole)	1.80	1.16	1.25	2.75	2.14	2.35
Pounds/participant (whole)	83	65	73	79	62	74
Percent of fall landings	29	32	24	46	29	39

<u>Fishing area</u>	CPUE source		Postseason
	In-season		
	<u>N</u>	<u>X</u>	<u>X</u>
Beaufort	18	18.9	28.7
St. Helena Sd.	5	37.2	29.7
Wadmalaw/Edisto	16	36.8	30.0
Charleston	89	26.8	23.4
Bulls Bay	27	20.5	20.3

of the Beaufort area, the CPUE trend was somewhat similar to that indicated by the postseason mailout results. The absolute values reported on the in-season cards were consistently higher but this was probably attributable to positive bias (i.e., those shrimpers who fared well were more likely to respond).

Season Comparisons

Parameter values for the 1992 season are compared with those from previous years in Table 11. For the first time since the permit system was implemented, the total number of permits sold declined from the previous year's level (-3.6%). Since both the estimated percentage of active permit holders and average number of assistants were relatively low in 1992, overall participation appeared to be moderately lower (down about 8%) than in the two preceding seasons. Average season effort per permit holder appeared to be the lowest except in the hurricane year (due perhaps to the inclement weather during much of the 1992 season), resulting in an appreciable decrease (-12%) from the 1990/1991 level.

Average season CPUE appeared to be nearly the same as in 1990 and appreciably better than that in 1991, despite somewhat similar conditions. As in 1991, the spring spawning population was large following a mild winter and estuarine sampling indicated very large numbers of juvenile shrimp in July. In 1991, rainfall during July was extremely heavy and accelerated the migration of shrimp from estuarine areas. In contrast, the 1992 July was abnormally dry and rainfall was not appreciable until August. Heavy rains during August and early September caused concern among baiters that significant outmigration would occur prior to the mid-September opening but this apparently did not occur. Although statewide estuarine sampling did indicate substantially reduced populations, the season opened with relatively good success, although the shrimp in most areas were below average size.

Showers and thunderstorms that struck the state from September through November made for the 14th wettest fall on record. Throughout the season, big tides and strong NE winds also made for adverse conditions. Heavy runoff may have contributed to the relatively poor shrimping in Charleston Harbor and the Santee/Winyah Bay area. Whatever the reason, the shrimping was consistently better in the southern half of the state, as was also the case in 1991.

In recent years, the relative distribution of the fall (white) shrimp harvest among shrimp baiters and commercial shrimpers has been a principal issue. The commercial catch monitoring system used in 1992 assigned the commercial catch by geographic area on a weekly basis, permitting an examination of recreational and commercial

landings in similar areas during a comparable time frame. For this exercise, reported commercial landings (all gears) during September week 3 through November week 2 were compared to estimated season baiting catches according to the following area designations:

<u>Baiting area (Fig. 1)</u>	<u>Commercial statistical zone</u>
Beaufort area	Hilton Head to Bay Point
St. Helena Sound	Bay Point to S. Edisto River
Wadmalaw/Edisto Islands	S. Edisto River to Stono Inlet
Charleston area	Stono Inlet to Dewees Inlet
Bulls Bay area	Dewees Inlet to C. Romain
Georgetown/Horry Counties	C. Romain to Garden City, including Santee and Winyah Bays

The figures in Table 12 are pounds of whole shrimp, using conversion factors of 1.54 to transform reported heads-off commercial landings and 1.48 to convert estimated whole quarts of recreationally caught shrimp. Table 13 lists the equivalent percentages represented by shrimp baiting landings in various categories.

Comparisons between areas are influenced by such factors as the relative sizes of the baiting populations and trawler fleets, proximity of population centers and trawler ports, and extent of estuarine areas vs trawlable coastal waters. With the exception of the Georgetown area, recreational shrimpers took a higher percentage of the season and total landings in those areas near population centers (Charleston, Beaufort/Hilton Head) and with relatively extensive estuarine systems. During the baiting season, the overall recreational catch was somewhat greater than the commercial harvest and equalled about two-fifths of the total (recreational plus commercial) documented fall harvest.

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Table 12. Estimated shrimp baiting catches and reported commercial landings by area. Figures are in pounds of whole shrimp.

Area	Recreational	Commercial		Total (Commercial & Recreational)	
		Sep. - Nov.	Aug. - Dec.	Sep. - Nov.	Aug. Dec.
Beaufort	996,189	100,702	172,281	1,096,891	1,168,470
St. Helena Sd.	169,143	567,393	1,235,491	736,536	1,404,634
Wadmalaw/ Edisto	264,269	192,948	397,905	457,217	662,174
Charleston	667,809	251,456	384,382	919,265	1,052,191
Bulls Bay	266,671	269,726	442,975	536,397	709,646
Georgetown/ Horry	22,314	545,397	1,026,587	567,711	1,048,901
Total	2,386,395	1,927,622	3,659,621	4,314,017	6,046,016

Table 13. Shrimp baiting catches expressed as percentages of landings in designated categories.

Area	Commercial catch		Total catch	
	Sep. - Nov.	Aug. - Dec.	Sep. - Nov.	Aug. - Dec.
Beaufort	989	578	91	85
St. Helena Sd.	30	14	23	12
Wadmalaw/Edisto	137	66	58	40
Charleston	266	174	73	63
Bulls Bay	99	60	50	38
Georgetown/Horry	4	2	4	2
Total	124	65	55	39

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APPENDIX 1. The 1992 survey questionnaire.



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1. What county do you live in? _____
2. How many trips did you make using your permit and gear?
____ SEP ____ OCT ____ NOV ____ All season ____ NONE
3. Please indicate the number of trips you made in each area:
____ BEAUFORT (incl. Calibogue Sd., Pt. Royal Sd., Broad R., Whale Branch R., etc. St. HELENA Sd. (incl. Coosaw, Morgan, Combahee, & Ashepoo R.) WADMALAW/EDISTO IS. (incl. N & S Edisto R.)
____ CHAS., incl. harbor & area rivers
____ BULLS BAY, incl. McClellanville area
____ GEORGETOWN, incl. Santee & Winyah Bays & Horry County
4. How many different people assisted you on your trips? _____
5. What was your average catch of shrimp per trip? _____
(in quarts of whole shrimp)
6. What was your total catch for the season? _____ quarts whole
7. Will you get a baiting permit next year? _____ YES _____ NO